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US 5666645 A US 5652613 A

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(54) Abstract Title
Programme guide information interface for a satellite broadcast receiver

(57) A program guide information interface device for a broadcast satellite receiver has a demultiplexor 204 for demultiplexing an input transport stream having an event information table in which program guide data is contained. The program guide data is stored in memory 208 in a plurality of storage areas S1, S2, S3, S4, with each of the storage areas storing program guide data of a predetermined time interval. A database processor 210 writes and stores the program guide data into memory 208 and updates the program guide data stored in a respective storage area when new program guide data of the predetermined time interval is received. A program guide processor 214 reads and outputs the program guide data which is stored in the memory in response to a program guide request signal from a user. Thus, the program guide processor 214 is able to respond immediately to user program guide requests.

FIG.2

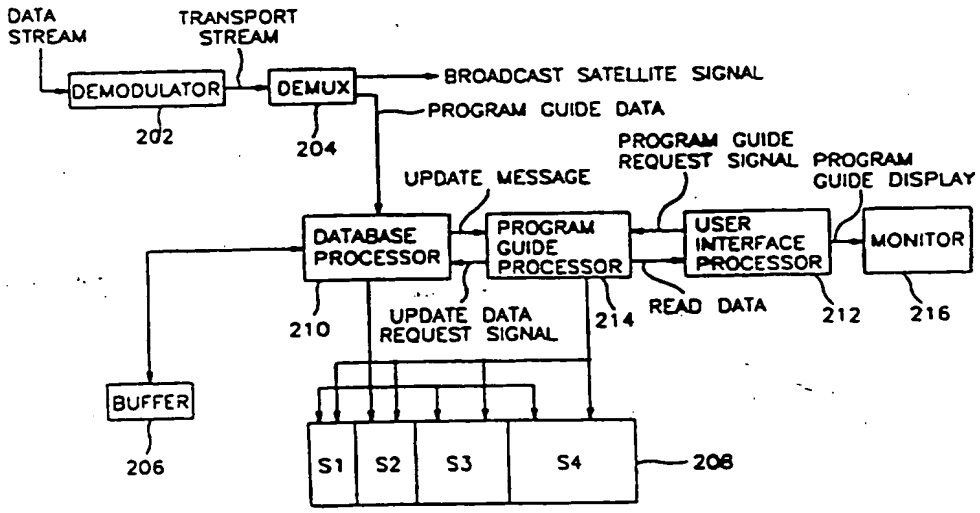

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FIG. 1
PRIOR ART

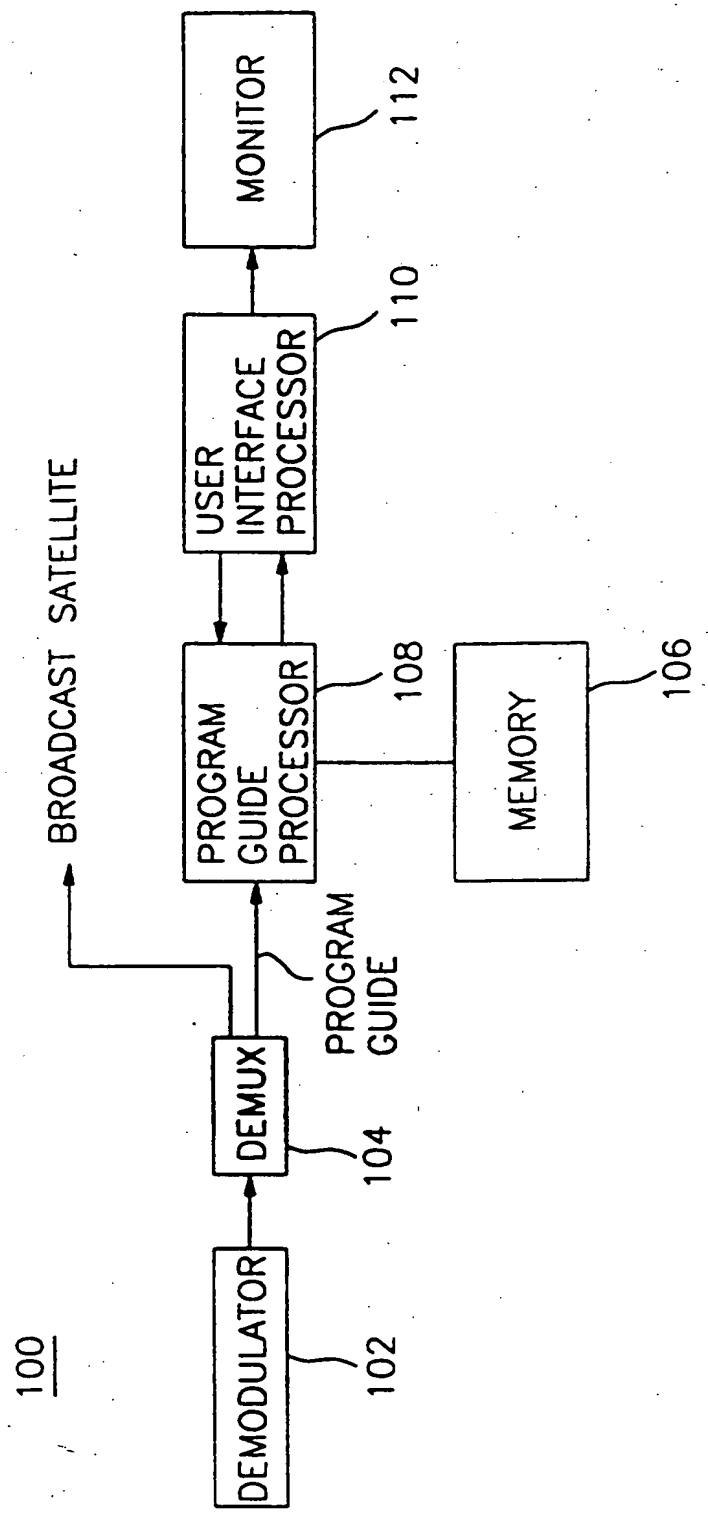

FIG.2

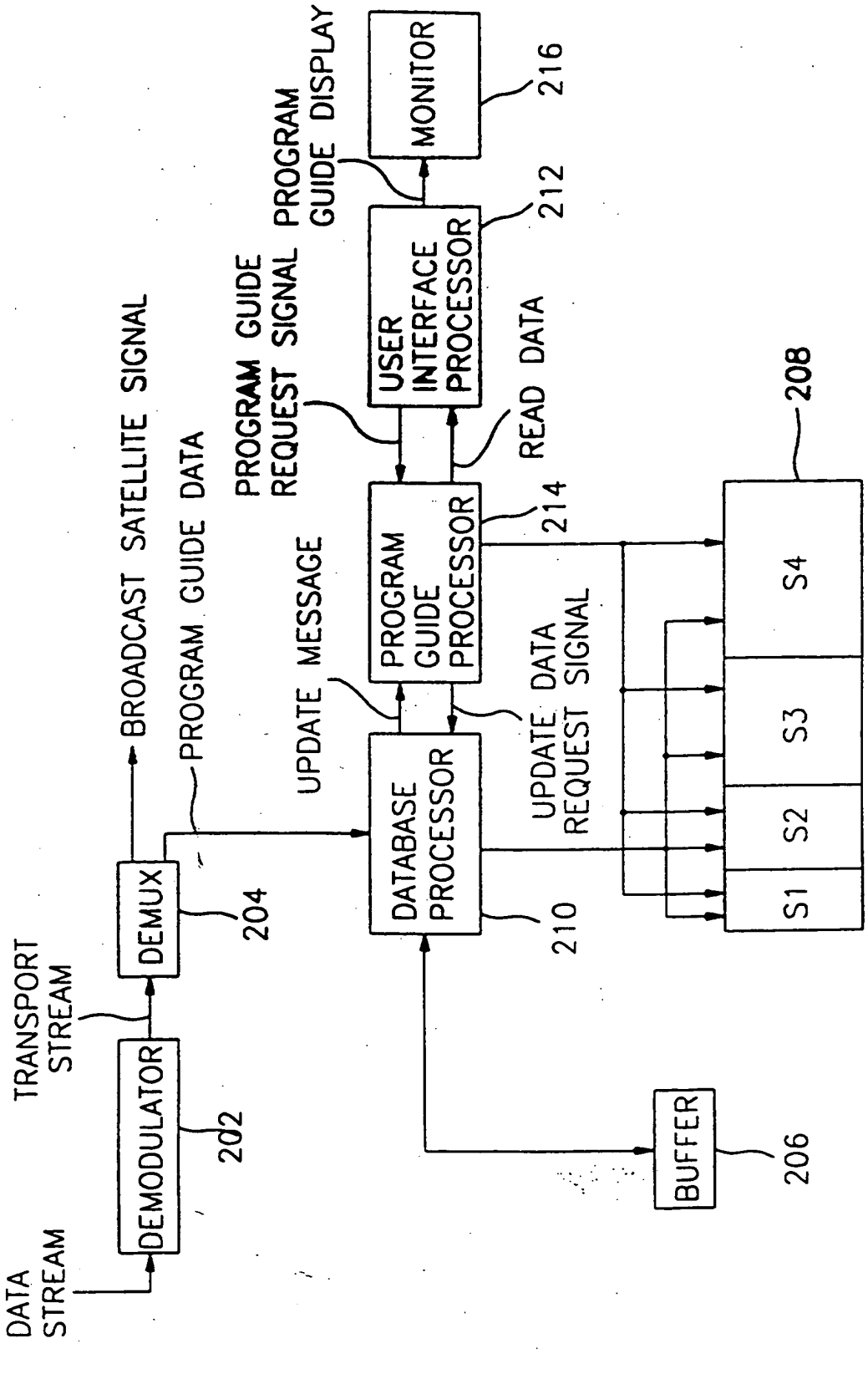
DATA STREAM
DEMODULATOR
202
TRANSPORT STREAM
DEMUX
204
BROADCAST SATELLITE SIGNAL
PROGRAM GUIDE DATA
UPDATE MESSAGE
DATABASE PROCESSOR
210
UPDATE DATA REQUEST SIGNAL
PROGRAM GUIDE REQUEST SIGNAL
PROGRAM GUIDE PROCESSOR
214
READ DATA
USER INTERFACE PROCESSOR
212
PROGRAM GUIDE DISPLAY
MONITOR
216
BUFFER
206
208
S1
S2
S3
S4

FIG.3

Syntax	No.of Bits	Identifier
Event_Information_section(){		
table_id	8	uimsbf
section_syntax_indicator	1	bsibf
reserved_future_use	1	bsibf
reserved	2	bsibf
section_length	12	uimsbf
service_id	16	uimsbf
reserved	2	bsibf
version_number	5	uimsbf
current_next_indicator	1	bsibf
section_number	8	uimsbf
last_section_number	8	uimsbf
transport_strean_id	16	uimsbf
original_network_id	16	uimsbf
segment_last_section_number	8	uimsbf
last_table_id	8	uimsbf
for(i=0;<N;i++){		
event_id	16	uimsbf
start_time	40	bsibf
duration	24	uimsbf
running_status	3	uimsbf
free_CA_mode	1	bsibf
descriptors_loop_length	12	uimsbf
for(i=0;i<N;i++){		
descriptor()		
}		
}		
CRC_32	32	rpchof
}		

PROGRAM GUIDE INFORMATION INTERFACE DEVICE FOR A SATELLITE BROADCAST RECEIVER

The present invention relates to a program guide information interface device for a broadcast satellite receiver.

The second edition of European Telecommunication Standard (ETS) specifies the Service Information (SI) data which forms a part of Digital Video Broadcasting (DVB) bitstreams, in order that the user can be provided with information to assist in selection of services and/or events within the bitstream, and so that the Integrated Receiver Decoder (IRD) can automatically configure itself for the selected service. SI data for automatic configuration is mostly specified within ISO/IEC 13818-1[1] as Program Specific Information (PSI). This ETS specifies additional data which complements the PSI by providing data to aid automatic tuning of IRDs, and additional information intended for display to the user. It is expected that Electronic Programme Guides (EPGs) will be a feature of Digital TV transmissions.

U.S. patent No. 5,589,892 discloses an electronic program schedule system, which provides a user with schedule information for programs viewed by the user on a television receiver, whether broadcast, cablecast, delivered by satellite, optical fiber, or any other means of program distribution.

Figure 1 shows a conventional program guide information interface device 100 in a broadcast satellite receiver. The conventional program guide information interface device 100 includes a demodulator 102, a demultiplexor (DEMUX) 104, a memory 106, a program guide processor 108, a user interface processor 110, and a monitor 112.

The demodulator 102 receives a data stream transmitted from a data provider (not shown) and demodulates the received data stream to generate the transport stream having an event information table (EIT) in which program guide data is contained. The demultiplexor 104 demultiplexes the transport stream having an event information table in which program guide data are contained from the demodulator 202 and obtains a broadcast satellite data and the program guide data contained in the EIT. The program guide processor 108

writes the program guide data from the demultiplexor 104 and stores it in the memory 106. The user interface processor 110 generates a program guide request signal according to a selection of a user.

The program guide processor 108 reads out the program guide data which are stored in the memory 106 in response to the program guide request signal according to a selection of a user from the user interface processor 110 and outputs the read program guide data to the user interface processor 110. The user interface processor 110 converts the program guide data read by the program guide processor 108 into program guide data display data and outputs it to the monitor 112. Accordingly, the monitor 112 displays a program guide based on the program guide display data from the user interface processor 110 on a screen so that the user can view the displayed program guide.

When the program guide data corresponding to the request of the program guide according to the selection of the user are not absent in the memory 106, the program guide processor 108 receives new program guide data corresponding to the request of the user and writes and stores it into the memory 106 to thereby update the program guide data. The program guide processor 108 reads out the updated program guide data which are stored in the memory 106 and outputs it to the user interface processor 110. The user interface processor 110 converts the updated program guide data read by the program guide processor 108 into updated program guide data display data and outputs it to the monitor 112. Accordingly, the monitor 112 displays an updated program guide based on the updated program guide display data from the user interface processor 110 on a screen so that the user can view the displayed update program guide.

In a conventional broadcast satellite receiver, a program guide processor stores received program guide data of a transport stream and controls the stored program guide data. Thus, large loads are put on the program guide processor so that the program guide processor responds slowly to user requests and slowly accesses a memory which stores updated program guide data. Moreover, when outputting program guide data upon request by the user, when the program guide data is updated, the operation of outputting the program guide data is stopped, to allow the updating operation be performed, and the outputting

operation be carried out. Accordingly, operations of outputting and updating program guide data cannot be performed simultaneously.

It is an object of the present invention to seek to solve, the problems identified above.

According to a first aspect of the present invention there is provided a program guide interface device for a satellite broadcast receiver, said device comprising:

input means for receiving an input transport stream containing program guide data;

memory for storing input program guide data,

a database processor for writing and storing the input program guide data into the memory, and for updating the stored program guide data every time new program guide data is received; and

a program guide processor for outputting program guide data from the memory in response to a user request.

Preferably, the program guide data is stored in said memory in a plurality of storage areas, each of the storage areas storing program guide data of a predetermined time interval; and wherein the database processor updates the program guide data stored in a respective storage area every time new program guide data of the predetermined time interval is received.

The invention also extends to a program guide interface device in a satellite broadcast receiver, said device comprising:

a demultiplexor for demultiplexing an input transport stream having an event information table in which program guide data are contained to obtain broadcast satellite data and the program guide data contained in the event information table;

a memory for storing the program guide data from the demultiplexor in a plurality of storage areas, each of the storage areas storing program guide data of a predetermined length of time;

a database processor for writing and storing the program guide data from the demultiplexor into the memory, and for updating the program guide data stored in the memory every time new program guide data of the predetermined

time interval are received from the demultiplexor; and

a program guide processor for reading and outputting the program guide data which are stored in the memory responsive to a program guide request signal according to a selection of a user.

In an embodiment of the invention, when a user requests a program guide, the program guide processor is able to respond immediately to the request. Thus, an interface device of the invention has a fast response. Furthermore, the database processor always checks transport packets transmitted from the demultiplexor, so that the interface device can quickly respond every time new guide information is received.

Embodiments of the present invention will hereinafter be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 show a block diagram of a conventional program guide information interface device in a broadcast satellite receiver;

Figure 2 shows a block diagram of a program guide information interface device in a broadcast satellite receiver of an embodiment of the invention; and

Figure 3 shows one example of a table illustrating an event information table (EIT) included in the transport stream generated by a demodulator of the embodiment of Figure 2.

ISO/IEC 13818[1] specifies SI which is referred to as PSI. The PSI data provides information to enable automatic configuration of the receiver to demultiplex and decode the various streams of programs within the multiplex. The PSI data is structured as four types of table. The tables are transmitted in sections.

1. For each service in the multiplex, a Program Association Table (PAT) indicates the location (the Packet Identifier (PID) values of the transport stream packets) of the corresponding Program Map Table (PMT). It also gives the location of the Network Information Table (NIT).

2. A Conditional Access Table (CAT) provides information on the

Conditional Access (CA) systems used in the multiplex. The information is private (not defined within this ETS) and dependent on the CA system, but includes the location of the EMM stream, when applicable.

3. A Program Map Table (PMT) identifies and indicates the locations of the streams that make up each service, and the location of the Program Clock Reference fields for a service.

4. The location of a Network Information Table (NIT) is defined in the ETS in compliance with ISO/IEC 13818-1[1] specification, but the data format is outside the scope of ISO/IEC 13818-1[1]. It is intended to provide information about the physical network. The syntax and semantics of the NIT are defined in this ETS.

In addition to the PSI, data is needed to provide identification of services and events for the user. The coding of this data is defined in this ETS. In contrast with the PAT, CAT, and PMT of the PSI, which give information only for the multiplex in which they are contained (the actual multiplex), the additional information defined within this ETS can also provide information on services and events carried by different multiplexes, and even on other networks. This data is structured as six tables as follows.

1. A Bouquet Association Table (BAT) provides information regarding bouquets. As well as giving the name of the bouquet, it provides a list of services for each bouquet.

2. A Service Description Table (SDT) contains data describing the services in the system, e.g. names of services, the service provider, etc.

3. An Event Information Table (EIT) contains data concerning events or programmes such as event name, start time, duration, etc. The use of different descriptors allows the transmission of different kinds of event information and allows timely automatic switching to events.

4. A Running Status Table (RST) gives the status of an event

(running/not running). The RST updates this information and allows timely automatic switching to events.

5. A Time and Date Table (TDT) gives information relating to the present time and date. This information is given in a separate table due to the frequent updating of this information.

6. A Time Offset Table (TOT) gives information relating to the present time and date and local time offset. This information is given in a separate table due to the frequent updating of the time information.

Figure 2 shows an embodiment of a program guide information interface device 200 in the broadcast satellite receiver. The program guide information interface device 200 includes a demodulator 202, a demultiplexor (DEMUX) 204, a buffer 206, a memory 208, a database processor 210, a user interface processor 212, and a program guide processor 214.

The demodulator 202 receives data stream transmitted from a data provider (not shown) and demodulates the received data stream to generate the transport stream having an event information table (EIT) in which program guide data are contained.

The EIT provides information in chronological order regarding the events contained within each service. Four classifications of EIT have been identified, distinguishable by the use of different table_ids. Figure 3 is one example of a table for illustrating the event information table (EIT) included in the transport stream generated by the demodulator shown in Figure 2.

Referring to Figure 3, a section_syntax_indicator is a 1-bit field which shall be set to "1". A section_length is a 12-bit field. The section_length specifies the number of bytes of the section, starting immediately following the section_length field and including the cyclic redundancy check (CRC). The section_length shall not exceed 4093 so that the entire section has a maximum length of 4096 bytes. A service_id is a 16-bit field which serves as a label to identify this service from any other service with a transport stream. The service_id is the same as the program_number in the corresponding

program_map_section. 5-bit field of a version_time is the version number of the sub_table. The version_number shall be incremented by 1 when a change in the information carried within the sub_table occurs. When it reaches value 31, it wraps around to 0. When the current_next_indicator is set to "1", then the version_number shall be that of the currently applicable sub_table defined by the table_id and service_id. When the current_next_indicator is set to "0", then the version_number shall be that of the next applicable sub_table.

A 1-bit current_next_indicator, when set to "1" indicates that the sub_table is the currently applicable sub_table. When the bit is set to "0", it indicates that the sub_table sent is not yet applicable and shall be the next sub_table to be valid. 8-bit field of a section_number gives the number of the section. The section_number of the first section in the sub_table shall be "0x00". The section_number shall be incremented by 1 with each additional section with the same table_id, service_id, transport_stream_id, and original_network_id. In this case, the sub_table may be structured as a number of segments. Within each segment the section_number shall increment by 1 with each additional section, but a gap in numbering is permitted between the last section of a segment and the first section of the adjacent segment. 8-bit field of a last_section_number specifies the number of the last section of the sub_table of which this section is part.

A transport_stream_id is a 16-bit field which serves as a label for identification of the transport stream, about which the EIT informs, from any other multiplex within the delivery system. 16-bit field of an original_network_id gives the label identifying the network_id of the originating delivery system. 8-bit field of a segment_last_section_number specifies the number of the last section of this segment of the sub_table. For sub_tables which are not segmented, this field shall be the same value as the last_section_number field. 8-bit field of a segment_last_section_number specifies the number of the last section of this segment of the sub_table. For sub_tables which are not segmented, this field shall be set to the same value as the last_section_number field. 8-bit field of a last_table_id identifies the last_table_id used. If only one table is used this is set to the table_id of this table. The chronological order of information is maintained across successive table_id values.

16-bit field of an event_id contains the identification number of the described event (uniquely allocated within a service definition). 40-bit field of a start_time contains the start time of the event in Universal Time, Co-ordinated (UTC) and Modified Julian Date (MJD). This field is coded as 16 bits giving the 16 LSBs of MJD followed by 24 bits coded as 6 digits in 4-bits Binary Coded Decimal. If the start time is undefined all bits of the field are set to "1".

For example, 93/10/13 12:45:00 is coded as "0xC079124500". A 24-bit field of a duration contains the duration of the event in hours, minutes, and seconds, (format: 6 digits, 4 bit BCD=24 bits). A running_status is a 3-bit field indicating the status of the event. 1-bit field of a free_CA_mode, when set to "0" indicates that all the component streams of the event are not scrambled. When set to "1" it indicates that access to one or more streams is controlled by a CA system. 12-bit field of a descriptors_loop_length gives the total length in bytes of the following descriptors. A CRC_32 is a 32-bit field that contains the CRC value that gives a zero output of registers (not shown) in a decoder (not shown) after processing the entire private section.

The demultiplexor 204 demultiplexes the transport stream having an event information table in which program guide data are contained from the demodulator 202 and obtains broadcast satellite data and the program guide data contained in the EIT. The buffer 206 temporarily stores the program guide data from the demultiplexor 204 under the control of the database processor 210.

The memory 208 stores the program guide data which are stored in the buffer 206 in a plurality of storage areas, each of the storage areas storing program guide data of a predetermined time interval. In the preferred embodiment of the present invention, the plurality of storage areas of the memory 208 preferably includes a first storage area S1, a second storage area S2, a third storage area S3, and a fourth storage area S4. The first storage area S1 stores first program guide data corresponding to a first time interval from a present time to four hours later. The second storage area S2 stores second program guide data corresponding to a second time interval from the four hours later to twelve hours later. The third storage area S3 stores third program guide data corresponding to a third time interval from the twelve hours later to seventy

two hours later. The fourth storage area S4 stores fourth program guide data corresponding to a fourth time interval from the seventy hours later to 168 hours later. In the preferred embodiment of the present invention, the buffer 206 has preferably a storage area identical to the fourth storage area S4 of the memory 208.

The database processor 210 writes and stores the program guide data from the demultiplexor 204 into the buffer 206. The database processor 210 reads the program guide data which are stored in the buffer 206 and writes and stores the program guide data into the memory 208. The database processor 210 receives new program guide data of the predetermined time interval from the demultiplexor 204 and updates the program guide data stored in the memory 208 as the new program guide data every time the new program guide data of the predetermined time interval are received from the demultiplexor 204. The database processor 210 generates an update message signal when the stored program guide data in the memory 208 is updated. The user interface processor 212 generates a program guide request signal according to the selection of the user. The user interface processor 212 converts the program guide data read by the program guide processor 214 into program guide display data. Accordingly, a monitor 216 displays a program guide based on the program guide display data from the user interface processor 212 on a screen.

The program guide processor 214 reads and outputs the program guide data which are stored in the memory 208 responsive to the program guide request signal according to a selection of a user from the user interface processor 212. The program guide processor 214 reads and outputs the program guide data updated by the database processor 210 responsive to the update message signal from the database processor 210.

The program guide processor 214 outputs an update data request signal to the data base processor 210 when a program guide data corresponding to the request of a program guide according to a selection of a user is absent in the memory 208. The database processor 210 receives new program guide data from the demultiplexor 204 responsive to the update data request signal from the program guide processor 214 and writes and temporarily stores the new program guide data into the buffer 206. The database processor 210 reads the new

program guide data stored in the buffer 106 and writes and stores it into the memory 208 so that the program guide data stored in the memory 208 is updated as the new program guide data.

The monitor 216 displays a program guide based on the program guide display data from the user interface processor 212 on a screen so that the user can view the displayed program guide. The monitor 216 displays an updated program guide based on the updated program guide display data from the user interface processor 212 on a screen so that the user can view the displayed update program guide.

The demodulator 202 receives data stream transmitted from a data provider (not shown) and demodulates the received data stream to generate the transport stream having an EIT in which program guide data are contained. The transport stream from the demodulator 202 is applied to the demultiplexor 204. The demultiplexor 204 demultiplexes the transport stream having an event information table in which program guide data are contained from the demodulator 202 and obtains broadcast satellite data and the program guide data contained in the EIT. The program guide data from the demultiplexor 204 are provided to the database processor 208. The database processor 210 writes the program guide data from the demultiplexor 204 into the buffer 206 so that the program guide data are temporarily stored in the buffer 206. The database processor 210 reads the program guide data which are stored in the buffer 206 and writes the program guide data into the memory 208.

The memory 208 stores the program guide data which are stored in the buffer 206 in a plurality of storage areas, each of the storage areas storing program guide data of a predetermined length of time. At this time, the first storage area S1 of the memory 208 stores a first program guide data corresponding to a first time period from a present time to four hours later. The second storage area S2 thereof stores a second program guide data corresponding to a second time period from the four hours later to twelve hours later. The third storage area S3 thereof stores a third program guide data corresponding to a third time period from the twelve hours later to seventy two hours later. The fourth storage area S4 thereof stores a fourth program guide

data corresponding to a fourth time period from the seventy hours later to 168 hours later.

The user interface processor 212 generates a program guide request signal according to the selection of the user. The program guide request signal generated by the user interface processor 212 is applied to the program guide processor 214. The program guide processor 214 reads the program guide data which are stored in the memory responsive to the signal indicative of a request of a program guide according to a selection of a user from the user interface processor 212 and outputs the read program guide data to the user interface processor 212. The user interface processor 212 converts the program guide data outputted from the program guide processor 214 into program guide display data. The program guide display data from the user interface processor 212 is fed to the monitor 216. Accordingly, a monitor 216 displays a program guide based on the program guide display data from the user interface processor 212 on a screen so that the user can view the program guide.

On the other hand, when new program guide data of the predetermined time interval from the demultiplexor 204 is transmitted to the database processor 210, the database processor 210 temporarily stores the new program guide data in the buffer 206. And the database processor 210 reads the new program guide data stored in the buffer 206 and writes and stores the read new program guide data into the memory 208 so that the program guide data stored in the memory 208 are updated as the new program guide data. At this time, the database processor 210 generates an update message signal when the stored program guide data in the memory 208 is updated. The update message signal generated by the database processor 210 is applied to the program guide processor 214.

The program guide processor 214 reads and outputs the program guide data updated by the database processor 210 responsive to the update message signal from the database processor 210. The updated program guide data from the program guide processor 214 is provided to the user interface processor 212. The user interface processor 212 converts the updated program guide data from the program guide processor 214 into updated program guide display data. The updated program guide display data from the user interface processor 212 is

outputted to the monitor 216. The monitor 216 displays an updated program guide based on the updated program guide display data from the user interface processor 212 on a screen so that the user can view the displayed update program guide.

The program guide processor 214 outputs an update data request signal to the database processor 210 when program guide data corresponding to the request of a program guide according to a selection of a user are absent in the memory 208. The database processor 210 receives new program guide data of the predetermined time interval from the demultiplexor 204 responsive to the update data request signal from the program guide processor 214 and writes and stores the new program guide data into the memory 208 through the buffer 206 so that the program guide data stored in the memory 208 is updated as the new program guide data.

The embodiment of the interface device illustrated has a routine of storing a received transport packet and a routine for controlling the stored transport packet separately. Since a database processor controls the stored transport packet, a program guide processor only stores the received transport packet and processes events that a user processor requests. Thus, it is unnecessary for the program guide processor to control the stored transport packet.

As mentioned above, when a user requests a program guide, the program guide processor can respond at once to the request of the user. Thus, the speed at which the interface device processes the program guide is fast. Also, since the database processor always checks the transport packet transmitted from the demultiplexor, the device can quickly respond every time new guide information enters.

It will be appreciated that modifications in, and variations to, the embodiments described and illustrated may be made within the scope of the appended claims.

CLAIMS

1. A program guide interface device for a satellite broadcast receiver, said device comprising:

input means for receiving an input transport stream containing program guide data;

memory for storing input program guide data;

a database processor for writing and storing the input program guide data into the memory and for updating the stored program guide data every time new program guide data is received; and

a program guide processor for outputting program guide data from the memory in response to a user request.

2. A program guide interface device as claimed in Claim 1, wherein the program guide data is stored in said memory in a plurality of storage areas, each of the storage areas storing program guide data of a predetermined time interval; and wherein the database processor updates the program guide stored in a respective storage area every time new program guide data of the predetermined time interval is received.

3. A program guide interface device in a satellite broadcast receiver, said device comprising:

a demultiplexor for demultiplexing an input transport stream having an event information table in which program guide data are contained to obtain broadcast satellite data and the program guide data contained in the event information table;

a memory for storing the program guide data from the demultiplexor in a plurality of storage areas, each of the storage areas storing guide data of a predetermined time interval;

a database processor for writing and storing the program guide data from the demultiplexor into the memory, and for updating the program guide data stored in the memory every time new program guide data of the predetermined time interval are received from the demultiplexor; and

a program guide processor for reading and outputting the program guide data which are stored in the memory responsive to a program guide request signal according to a selection of a user.

4. A program guide interface device as claimed in Claim 2 or Claim 3, wherein the plurality of storage areas of the memory includes a first storage area for storing first program guide data corresponding to a first time interval from a present time to four hours later, a second storage area for storing second program guide data corresponding to a second time interval from the four hours later to twelve hours later, a third storage area for storing third program guide data corresponding to a third time interval from the twelve hours later to seventy two hours later, and a fourth storage area for storing fourth program guide data corresponding to a fourth time interval from the seventy hours later to 168 hours later.

5. A program guide interface device as claimed in any preceding claim, wherein the database processor generates an update message signal when the stored program guide data in the memory is updated, and the program guide processor reads and outputs the program guide data updated by the database processor responsive to the update message signal from the database processor.

6. A program guide interface device as claimed in any preceding claim, wherein the program guide processor outputs an update data request signal to the database processor in the absence in memory of program guide data selected by a user, and the database processor is arranged to receive new program guide data in response to the update data request signal from the program guide processor and to write the new program guide data into memory to thereby update the program guide data stored in the memory.

7. A program guide interface device as claimed in any preceding claim, further comprising a demodulator for demodulating an input data stream to generate the input transport stream which has an event information table.

8. A program guide interface device as claimed in Claim 3, further comprising a buffer for temporarily storing the program guide data from the demultiplexor.

9. A program guide interface device as claimed in any preceding claim, further comprising a user interface processor for generating the program guide

request signal according to the selection of the user and for converting the program guide data read by the program guide processor into program guide display data.

10. A program guide interface for a satellite broadcast receiver substantially as hereinbefore described with reference to Figures 2 and 3 of the accompanying drawings.

The Patent Office

INVESTOR IN PEOPLE

Application No: GB 9822940.4
Claims searched: All

Examiner: Joe McCann
Date of search: 2 February 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H4F(FAAN,FBA,FBB,FDE,FDX)

Int Cl (Ed.6): H04N(1/00,5/445,7/088,7/16)

Other: Online: WPI, PAJ, EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
XP	EP 0823798A1	(THOMSON MULTIMEDIA) - see abstract	1,3
X	WO 97/24874A1	(TELE COMMUNICATIONS INC) - see abstract	1,3
X	US 5699125	(MATSUSHITA ELECTRIC CORP) - see abstract	1,3
X	US 5666645	(NEWS AMERICA PUBLICATIONS INC) - see abstract	1,3
X	US 5652613	(BERYL ET AL) - see abstract	1,3

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